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HEALTH AND SAFETY COMMISSION

HSC CO-ORDINATED PROGRAMME OF NUCLEAR SAFETY RESEARCH

Evaluation Report for 2002/3

Note from the Director, Nuclear Safety Directorate (NSD)

ISSUE

1 Annual report for 2002/3 on the evaluation of the HSC Coordinated Programme of Nuclear Safety Research.

TIMING

2 Routine. This reports relates to existing and new projects managed by the IMC and HSE in the financial year 2002/2003. The availability of final outturn information on the programme from both HSE and the licensees determines the timetable for preparation of the report.

RECOMMENDATIONS AND DECISIONS

3 The HSC is asked to note and, if appropriate, comment on the report, which summarises the HSE's and licensees' evaluation of the efficiency and effectiveness of the 2002/2003 HSE Coordinated Programme.

IDENTIFICATION AND COMMISSIONING OF PROGRAMME

4 HSE is responsible for ensuring that the HSC Coordinated Programme of Nuclear Safety Research is balanced and adequate. The Programme comprises three elements:

- work contracted collectively by the licensees through a body called the Industry Management Committee (IMC) - the IMC Programme;
- work contracted by HSE with costs recovered from the licensees by levy - the Levy Programme.
- work contracted by the individual licensees for their own purposes but declared relevant to the Co-ordinated Programme - the Industry Direct Programme.

5 HSE directs the IMC and Levy elements of the programme by identifying safety concerns which may benefit from research. These concerns are prioritised as

individual safety issues in a document called the Nuclear Research Index (NRI). The third element is directed by the licensees but is made transparent to HSE.

6 HSE presented the arrangements for identifying and commissioning the 2002/2003 HSC Coordinated Programme of Nuclear Safety Research to the May 2002 meeting of the HSC (HSC/02/13). The paper advised that the programme met the objectives, and requirements for balance and adequacy, called for by guidelines set out by the President of the Board of Trade. The HSC agreed the total programme for 2002/2003.

CONSULTATION

7 HSE's overall strategy for nuclear safety research is reviewed annually, along with the strategy for each technical area within the NRI, and these are published annually as part of the NRI. This is to ensure that the programme addresses issues of real need that will be of long-term benefit to the safety of nuclear reactor plant. The Nuclear Safety Advisory Committee, through its sub-committee on research (NuSAC SCR), has advised on the strategy as part of its consideration of the NRI, and of other aspects of the programme. Other government departments, MOD and DTI are consulted through their representation on HSE's Nuclear Safety Research Steering Group (NSRSG).

EVALUATION OF 2002/2003 HSC COORDINATED PROGRAMME.

8 Table 1 compares planned expenditure on the Levy and IMC programmes proposed to the HSC in 2002 with the final outturn expenditure. The table also includes figures for the Industry Direct Programme. The spend was lower than planned by approximately 12%. This is within an acceptable margin and reflects changes to the programme arising from developments throughout the year, eg. the diversion of HSE and Licensee resources to emerging operational issues and minor contract delays leading to reduced spend in the financial year.

9 HSE and the IMC have conducted evaluations of their respective parts of the 2002/2003 programme which were reported to HSE's NSRSG in March 2004 and to NuSAC SCR in April 2004. HSE has also completed an assessment of the IMC's Industry Direct Programme which was reported in paper NuSAC/SCR/04/7 presented to the April 2004 meeting of the sub-committee. The outcome of these evaluations is discussed further below.

10 Annex 1 provides details of examples of how the 2002/2003 Coordinated Programme helped to secure higher standards of nuclear safety.

Levy Programme

11 In 2002/2003 the Levy Programme comprised 43 projects. HSE have evaluated the 14 contracts that were completed during the year. Table 2 summarises the key research benefits of these projects and the performance of the contractors.

12 All of the evaluated projects were found to have benefited nuclear safety in some way. The evaluation revealed that Levy projects have delivered outcomes that would inform HSE's judgement of nuclear safety either immediately or in the longer term. Almost all of the projects had contributed to the maintenance of nuclear knowledge and expertise. The programme was successful in closing out, or satisfactorily progressing, the relevant NRI issues.

13 Project officers reported that, in general, Levy contractors performed very well on all measures relating to the technical content of the research. They found the contractors' management of the projects, the reporting of the results and the standard of other deliverables to be above average. The evaluation revealed that a approximately a third of the contractors were unable to meet timescales or failed to keep the project officer properly informed on progress.

14 HSE concludes that, in general, the Levy projects completed in 2002/2003 made an effective contribution to nuclear safety and that the contracts represented reasonable value for money.

IMC Programme.

15 Table 3 summarises the Licensees' review of the 2002/2003 IMC programme. Of the 75 Completion Reports issued for contracts completed during the year, 68 proposed closure of the NRI. HSE has agreed to the closure to about one third of these and closure of the others is being discussed at the regular Technical Exchanges.

16 The Licensees judged in excess of 70% of the completed projects had already delivered readily identifiable benefits to nuclear safety and most projects helped to maintain knowledge and expertise. Thus benefits from the programme are not necessarily awaiting HSE's agreement to closure of issues. HSE concludes that the IMC programme made an effective contribution to nuclear safety.

Licensees' Industry Direct Programme.

17 HSE's assessment of a sample of BE's and MGBG's 2002/2003 Industry Direct Programmes concluded that:

- the research projects were of generic importance to the continued safe operation of nuclear reactors;
- they have made an important contribution to the maintenance and development of nuclear safety related capabilities, knowledge and expertise and helped the Licensees to respond to emergent issues;
- they have delivered validated enhancements to procedures, codes, and material data which are informing arguments that underpin nuclear safety.

DISSEMINATION

18 HSE is committed to disseminating research results that have implications for nuclear safety, and has previously developed a strategy for the dissemination of information which has been endorsed by the NuSAC SCR. Increasing use is being made of the HSE website to keep the technical community informed of the research carried out under the Levy Programme. Additionally, nuclear safety research either undertaken or planned, is shared with the rest of HSE through HSE's Research Co-ordinator's network.

19 HSE recognises that the licensees own the rights to most of the intellectual property derived from the IMC programme. Under agreements, both between HSE and licensees, and between the licensees themselves, these results are made transparent to the extent that they are accessible and can be put to limited use by all parties.

FINANCIAL/RESOURCE IMPLICATIONS FOR HSE

20 The cost of the research commissioned by HSE and the programme management charges are recovered by a levy made on the nuclear licensees. There are no additional financial implications for HSE.

ENVIRONMENTAL IMPLICATIONS

21 There are none.

OTHER IMPLICATIONS

22 There are none.

CONCLUSIONS.

23 The IMC and HSE evaluations of the 2002/2003 HSC Coordinated Programme of Nuclear Safety Research concluded that:

- actual expenditure was within 12% of that originally proposed to HSC in 2002;
- the Levy programme has progressed or closed NRI issues and made an effective contribution to nuclear safety and the contracts represented reasonable value for money;
- the IMC programme has progressed or closed a significant number of NRI issues and made an effective contribution to nuclear safety;
- the Industry Direct Programmes of research were of generic importance to the continued safe operation of nuclear reactors and have helped the Licensees to respond to emergent nuclear safety issues.

25 HSE has taken steps to encourage the dissemination of the output from 200/2003 programme of research both within the industry and HSE which recognise the licensees' rights to IPR.

ACTION

26 The HSC are requested to note the paper and comment if appropriate.

TABLE 1

HSC Co-ordinated Programme Expenditure 2002/2003

	Plan	**Outturn**	**Comment**
	£M (ex VAT)	**£M (ex VAT)**	
Levy	1.55	1.21	
IMC	5.59	5.43	
Total (Levy + IMC)	**7.14**	**6.64**	7% less than planned
Industry Direct	8.41	7.10	16% less than planned.
Overall HSC Programme	**15.55**	**13.74**	12% less than planned
Management charges:			
HSE	0.3	0.18	
IMC	0.28	0.27	
Total Management Charges	**0.58**	**0.45**	

TABLE 2: EVALUATION OF LEVY PROGRAMME 2002/2003
Completed Contracts Only (14)

a) Research Benefits

Safety benefits (multiple answers possible)	
Short term safety benefit	8
Long term safety benefit	9
Maintenance of knowledge & expertise	12
Issue closure (14 projects total)	
Issue closed	5
- Because reports address issue	4
- Because no further appropriate research	1
Issue closed for one company	5
Issue progressed and redefined	4

b) Contractor Performance

Contractor performance			
	Good	Average	Poor
Meeting specification	11	2	1
Meeting objective	11	2	1
Scientific quality	12	1	1
Report Standard	7	7	0
Standard of computer code deliverables, where appropriate	2	2	0
Value for money (incomplete response)	6	5	1
Meeting budget costs	8	6	0
Meeting timescales	5	5	4
Keeping project officer informed	7	4	3

TABLE 3: EVALUATION OF IMC RESEARCH PROGRAMME 2002/2003

Projects managed by IMC in 2002/2003	**129**
Completion Reports Issued by IMC	**75**
Awaiting peer review	**1**
Research continues in 03/04	**6**
Propose Closure of NRI Issue	**68**
- HSE Agreed Closure	23
- With HSE for consideration	45
Projects judged to benefit nuclear safety	**54**

ANNEX 1 TO HSC/04/20

2002/2003 HSC COORDINATED PROGRAMME OF NUCLEAR SAFETY RESEARCH

Securing Higher Safety Standards

The work of the programme contributes to securing higher standards of nuclear safety. Examples taken from a number of technical areas are presented below:

C&I

The various research projects contribute to the development of internal guidelines by the licensees, including BNFL. The FP5 project CEMSIS has considered ways of producing safety justification framework that will be used to improve the approaches to modernisation and refurbishment of C&I systems important to nuclear safety. The work on smart sensors has led to a better understanding of the related concerns and approaches to safety justification of these devices.

External Events

A survey has examined which environmental conditions (e.g. wind, rainfall, temperature) which are routinely measured to determine the feasibility of developing a database of information that can be used to establish the frequency of abnormal conditions.

The second phase of a three phase project examined the impact of climate change on a selection of UK nuclear power station sites.

The programme continued to finance UK's participation in the IAEA collaborative research programme on the safety significance of near field earthquakes.

Graphite

2002/3 saw the start of levy-funded research to establish an independent capability for NSD. This work will continue to provide support to NII in the performance of its regulatory duties. A strategic review pf nuclear graphite technology was also initiated by NSD in 2002/3 and its outcome was reported recently. In response to this, NII is developing a revised strategy for maintenance and improvement of core safety cases. The licensees' research programmes tended to focus on establishing the consequences of core ageing. Due to recent operational events the focus of the programme has now shifted towards obtaining a more fundamental understanding of ageing processes and their effect on core safety functionality. New safety cases have incorporated these research results.

Nuclear Systems and Engineering

A programme to monitor the long term reliability of Valve regulated Lead Acid Batteries (VRLA) was completed and the results will support relevant safety submissions.

The programme has delivered two developments that will enhance in-reactor inspection capability: a lightweight reeled manipulator arm attachment for use with the vertical delivery system (Rollatube) previously developed under the HSC Programme ; and two compact infra-red cameras offering improved image quality.

Testing of a simulated fuelling machine main body seal has demonstrated the durability of in-situ seal repair techniques.

Plant Life Management - Steels

Direct support continued to the development of the R5/R6 structural integrity assessment procedures, routinely used for safety cases for all stations. Improved understanding of the effect of repairs in stainless steel welds on the susceptibility to reheat cracking has been obtained by residual stress modelling and measurement. In conjunction with materials testing programmes to determine creep ductility of constituent materials and novel Non Destructive Testing techniques, this is addressing a current plant problem for AGRs.

Plant Life Management - Civil Engineering.

The advanced mechanical testing rig at Sheffield University has successfully characterised the response of concrete specimens to multi-axial loading with elevated temperatures above 150 deg. C. The rig continues to provide data for the Euratom 5th Framework Project MAECENAS.

A Levy funded project completed the post test finite element analysis of the Sandia national Laboratory 1/4 scale model of a prestressed concrete containment. This work will inform HSE's participation in the OECD/NEA workshop on the Sandia test scheduled for March 2004.

Probabilistic Safety Analysis

The programme has added additional data to the ALARP Decisions Database. The database is used by safety case officers and authors to identify precedents and thus helps to maintain consistency in safety arguments.

The Reliability of Repair project has evaluated the practical application of a generic approach to the assessment of repair activities. A review panel concluded that the approach was both feasible and appropriate.

Waste and Decommissioning.

Several projects comprising reports, workshops etc. have examined various life extension aspects relating to the storage of immobilised waste. These included: condition of containers and their contents; impact of container movement on corrosion; properties of cement grouts; and development of codes and standards for containers.

The 2002/03 programme has also addressed: testing of activated carbon; compact plant for radionuclide removal; the treatment of contaminated oils; and immobilisation of radionuclides in absorber materials.

Decommissioning related projects addressed: liquid effluent management during the Care and Maintenance Period; and the long term durability of cladding materials and systems for Safestore structures.